Idaho Department of Water Resources
Open-File Report

Summary of Ground Water Levels in the Curlew Valley Ground Water Monitoring Network – 2009 Update

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Introduction

The Idaho Department of Water Resources manages a ground water level monitoring network in the Curlew Valley, Idaho. The monitoring network currently consists of 12 wells that are measured on a semi-annual basis. The purpose of the ground water monitoring program is to observe water levels within the Curlew Valley Critical Ground Water Area (CGWA). The Curlew Valley CGWA was designated on March 15, 1976. Designation was based on concern that there was not sufficient ground water supply for existing irrigation uses or to fulfill pending applications and permits.

No further studies have been conducted since designation of the CGWA to determine adequacy of supply or impacts on spring flows. However, several reports exist that summarize the ground water conditions in the Curlew Valley (Bendixson, 1996; IDWR, 1976; Baker, 1974; Chapman and Young, 1972; Bolke and Price, 1969; Nace, 1952; and Thompson and Farris, 1932). A management plan has not been developed for the area nor has an advisory committee been formed. Currently, data from this monitoring network provides the primary source of information for the management of the ground water resource in this area.

Purpose and Scope

The purpose of this report is to summarize the status of the ground water monitoring network and present the water level measurements collected over through the history of this network.

Status of the Monitoring Network

Historically, up to 23 wells have been included in the monitoring network for this area (wells with five or more water level measurements). Currently, 12 of the 23 historic wells are being measured on a semi-annual basis (Figure 1). Table 1 summarizes the historical network and identifies the wells that are currently active in the monitoring.

Monitoring data exists dating back to 1931 for the oldest record in the network. Data for approximately half of the wells in the historic network consists of a short duration of measurements, or contain a few sporadic measurements over a long period of record. Wells included in the historic network that are no longer being monitored have been dropped from the network due to access restrictions or poor data quality (i.e. unreliable measurements).

Data for the active wells consists of semi-annual measurements from 1999 through 2009, with the exception of two wells. These wells, 16S32E-27DAB1 and 15S32E-09AAA2, have semi-annual measurement data from 1968 through 2009, creating the most complete and detailed water level records in the network. Water level data for the current monitoring network are displayed in Appendix A.

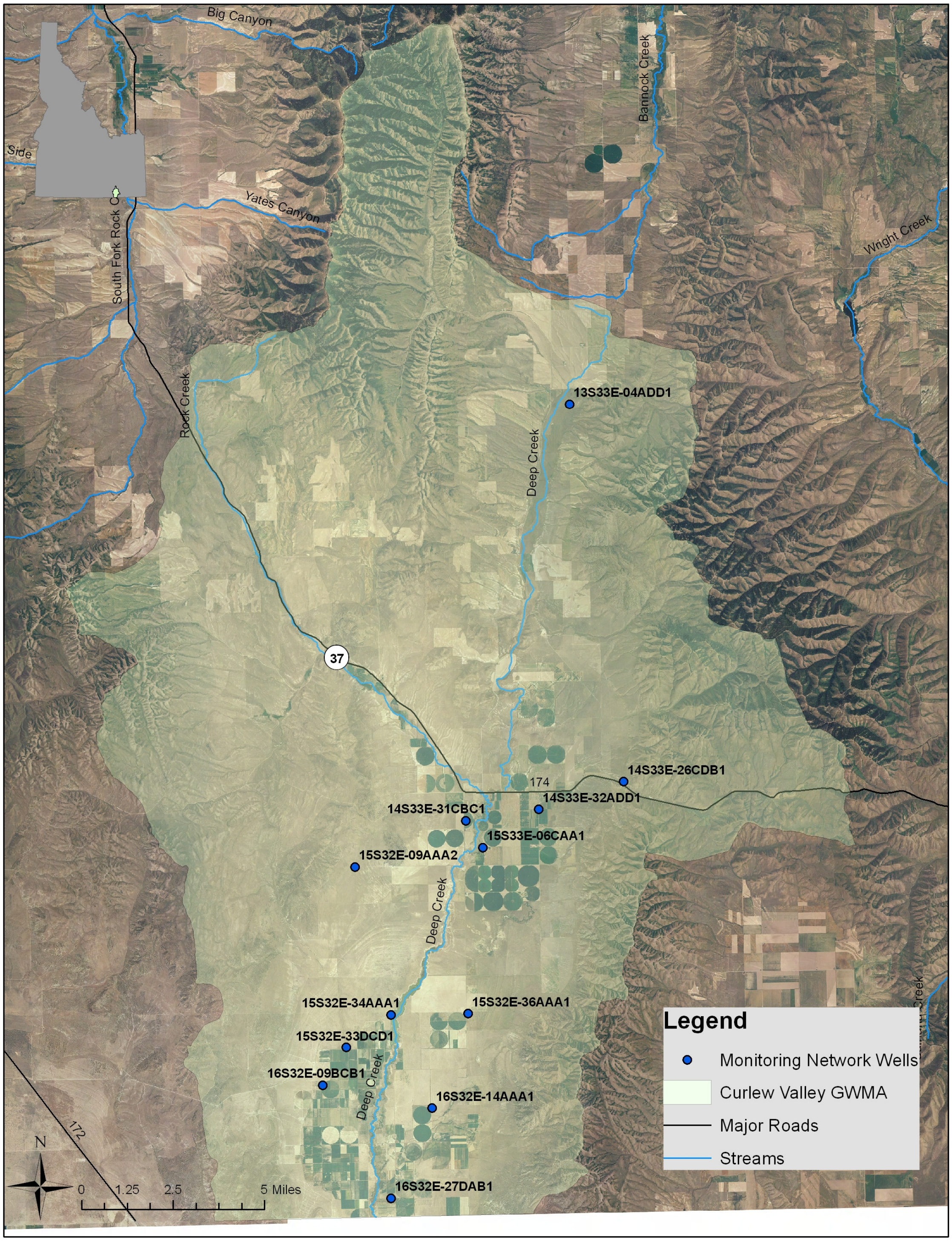

Figure 1. Current (2009) Curlew Valley Ground Water Level Monitoring Network.

Table 1. Summary of the Historical Ground Water Monitoring Network for the Curlew Valley CGWA.

Well ID	Period of Water Level Record	Current Status of the well	Comments
12S33E23DBB1	1987-1988	Inactive	Dropped from network after one year of data collection.
12S33E27CDC1	1987-1988	Inactive	Dropped from network after one year of data collection.
13S33E04ADD1	1947-2009	Active	Well currently being measured as part of the monitoring network.
14S33E16BBB1	1947-2008	Inactive	Dropped from network in 2008 due to access restrictions.
14S33E26CDB1	1947-2009	Active	Semi-annual measurements began on this well in 1999.
14S33E31ABC1	1941-1950	Inactive	Well with 32 measurements collected by the USGS and dropped in 1950.
14S33E31ACC1	1967-2000	Inactive	Well with 5 historically measurements collected by the USGS.
14S33E31CBC1	1970-2009	Active	Semi-annual measurements began on this well in 1999.
14S33E32ADD1	1969-2009	Active	Semi-annual measurements began on this well in 1999.
14S34E31DBD1	1947-1956	Inactive	Well with 20 measurements collected by the USGS.
15S32E09AAA2	1969-2009	Active	Detailed record of 93 measurements collected by the USGS. IDWR began measurements of this well in 2009.
15S32E26AAC1	1931-1970	Inactive	Six measurements collected by the USGS.
15S32E33DCD1	1969-2009	Active	Semi-annual measurements began on this well in 1999.
15S32E34AAA1	1969-2009	Active	Semi-annual measurements began on this well in 1999.
15S32E36AAA1	1959-2009	Active	Semi-annual measurements began on this well in 1999.
15S33E06CAA1	1969-2009	Active	Semi-annual measurements began on this well in 1999.
15S33E21CCC1	1931-2000	Inactive	Six measurements collected by the USGS and IDWR.
15S34E06ABB1	1947-1962	Inactive	Twenty water levels collected by the USGS.
16S32E09BCB1	1969-2009	Active	Semi-annual measurements began on this well in 1999.
16S32E14AAA1	1969-2009	Active	Semi-annual measurements began on this well in 1999.
16S32E27DAB1	1969-2009	Active	Detailed record of 92 measurements collected by the USGS. IDWR began measurements in 2009.
16S33E36AAA1	1955-1998	Inactive	IDWR collected 68 measurements prior to dropping it from the network in 1998.
16S33E36AAA2	1935-1998	Inactive	IDWR collected 88 measurements prior to dropping it from the network in 1998.

Summary of Water Level Data

A review of the data from the wells included in the current monitoring network was conducted to summarize the general water level elevations, historic changes in water levels, recent (10-year) changes in water levels, and seasonal fluctuations experienced in each well. Analyses of the data from wells in the historic monitoring network were not conducted. The review of the data indicated 10 of the 12 currently monitored wells display similar patterns, water level changes, and seasonal fluctuations.

General Water Level Elevation Analysis

To review the overall elevations of the water levels collected, a ground water flow map was produced (Figure 2). The purpose of this map was to show the general ground water flow direction, to investigate the potential for multiple aquifers to exist, and to identify any potential errors associated with the well head elevations.

The ground water flow map indicates a general north to south flow direction, based on the water level measurements collected in the fall of 2009. The relatively smooth and evenly spaced ground water contours suggest that all of the wells in the monitoring network are completed into the same aquifer system. There are two minor deviations from the overall north to south flow paths that exist near the two most densely populated agricultural areas of the valley. These deviations can most likely be attributed to the pumping demand associated with the irrigation practices in these agricultural areas, as expected.

During the development of the ground water flow map, one well was identified with an incorrect wellhead elevation. Well 15S33E-06CAA1 had a wellhead elevation listed as 4,590 feet above mean sea level (msl). A review of alternate data sources (GIS digital elevation maps and topographic maps) showed that the actual elevation for this well is approximately 4,760 feet above msl, a change of 170 feet. The remaining wellhead elevations appear to be accurate.

Overall Water Level Changes

To evaluate the current conditions of the aquifer, an analysis of water levels was conducted that included determining the differences between the historic water levels and current water levels. All but two of the currently monitored wells in the network indicate lower water levels in the spring 2008 measurements than the original water level measured in the spring for each well. The two wells that show an increase in water levels are 13S33E-04ADD1 and 14S33E-26CDB1, and are the two most northern wells in the network. These two wells show water level increases of 7.4 and 12.8 feet, respectively. The remaining wells in the network show overall water level declines ranging from 0.9 to 23 feet. The water level differences between the spring of 1970 to the spring of 2008 are listed in Table 2 and are mapped in Figure 3.

Recent Water Level Changes

Considering that majority of the wells in the current monitoring network include wells that have only one measurement before the Department began semi-annual measurements in 1999, an analysis of the data collected over the past 10 years was conducted to evaluate any recent changes in water levels. All 12 of the wells in the current network show similar water level declines over the past 10 years. One well, 15S32E-09AAA2, indicates an increase in water levels when comparing the fall 1999 water level measurement to the fall 2009 measurement. This increase can be attributed to the four historically low water levels measured in 1998 and 1999. Excluding these four low measurements, the water levels from this well follow a similar trend exhibited by the remainder of the wells in the network (Figure 4).

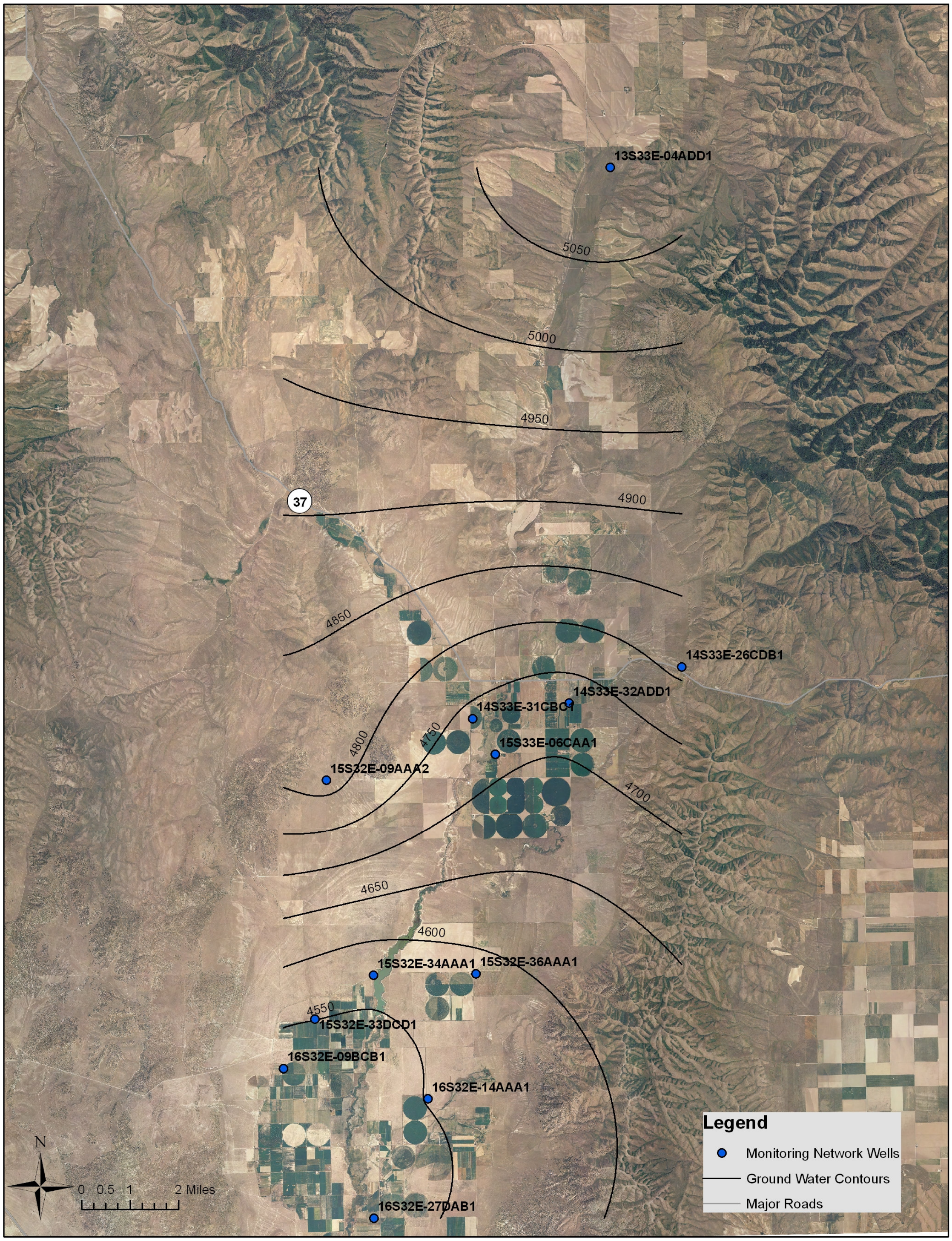

Figure 2. Ground water flow map for the Curlew Valley area using October 2009 water level measurements.

Table 2. Statistical summary of water level records for wells in current monitoring network.

Well Number	Maximum Seasonal Fluctuation (feet)	Minimum Seasonal Fluctuation (feet)	Average Seasonal Fluctuation (feet)	10-YR Water Level Change (feet)	Overall Water Level Change (feet)
13S33E-04ADD1	9.7	0	1.1	Decline of 1.4	Rise of 7.4
14S33E-26CDB1	17.9	0.1	2.9	Decline of 7.9	Rise of 12.8
14S33E-31CBC1	16.1	0.8	8.1	Decline of 13	Decline of 13.8
14S33E-32ADD1	7.3	1.7	3.9	Decline of 16.6	Decline of 16.1
15S32E-09AAA2	5.3	0	1.0	Rise of 1.4	Decline of 5.8
15S32E-33DCD1	5.6	1.0	3.8	Decline of 8.4	Decline of 15.3
15S32E-34AAA1	14.5	2.0	8.2	Decline of 4.2	Decline of 7.3
15S32E-36AAA1	35.3	0	10.0	Decline of 4.1	Decline of 4.9
15S33E-06CAA1	19.0	1.0	10.9	Decline of 18.2	Decline of 23.1
16S32E-09BCB1	7.4	1.6	4.7	Decline of 9.4	Decline of 20.3
16S32E-14AAA1	10.8	0.2	5.7	Decline of 7.7	Decline of 0.9
16S32E-27DAB1	25.6	0.1	8.8	Decline of 8.5	Decline of 7.9

On average, water levels in the Curlew Valley area have declined 8.2 feet in the past 10 years, resulting in an average decline of 0.82 feet/year. Although not significant, these declines are apparent in all of the monitoring wells in the current network, indicating the water level decline is a regional phenomenon. Considering the historic water level analysis also indicated higher water levels in the 1970's than now, it appears the aquifer for this area has yet to reach equilibrium in terms of recharge versus discharge.

Seasonal Fluctuations

Seasonal responses to aquifer pumping and recharge are apparent in the hydrographs for each well. In general, the hydrographs show similar responses to pumping and recharge events (Figure 4). The maximum, minimum, and average seasonal fluctuations for each well were determined by finding the difference between the semi-annual (fall and spring) measurements (Table 2). The maximum seasonal fluctuation was experienced by well 15S32E-36AAA1 that showed a change of 35.3 feet between March of 2009 and October of 2009. Three wells (13S33E-04ADD1, 15S32E-09AAA2, and 15S32E-36AAA1) show years in which seasonal fluctuations were not measurable, but in general, all of the wells show some degree of seasonal fluctuation, with an average change for all of the wells in the current network of 5.8 feet per season.

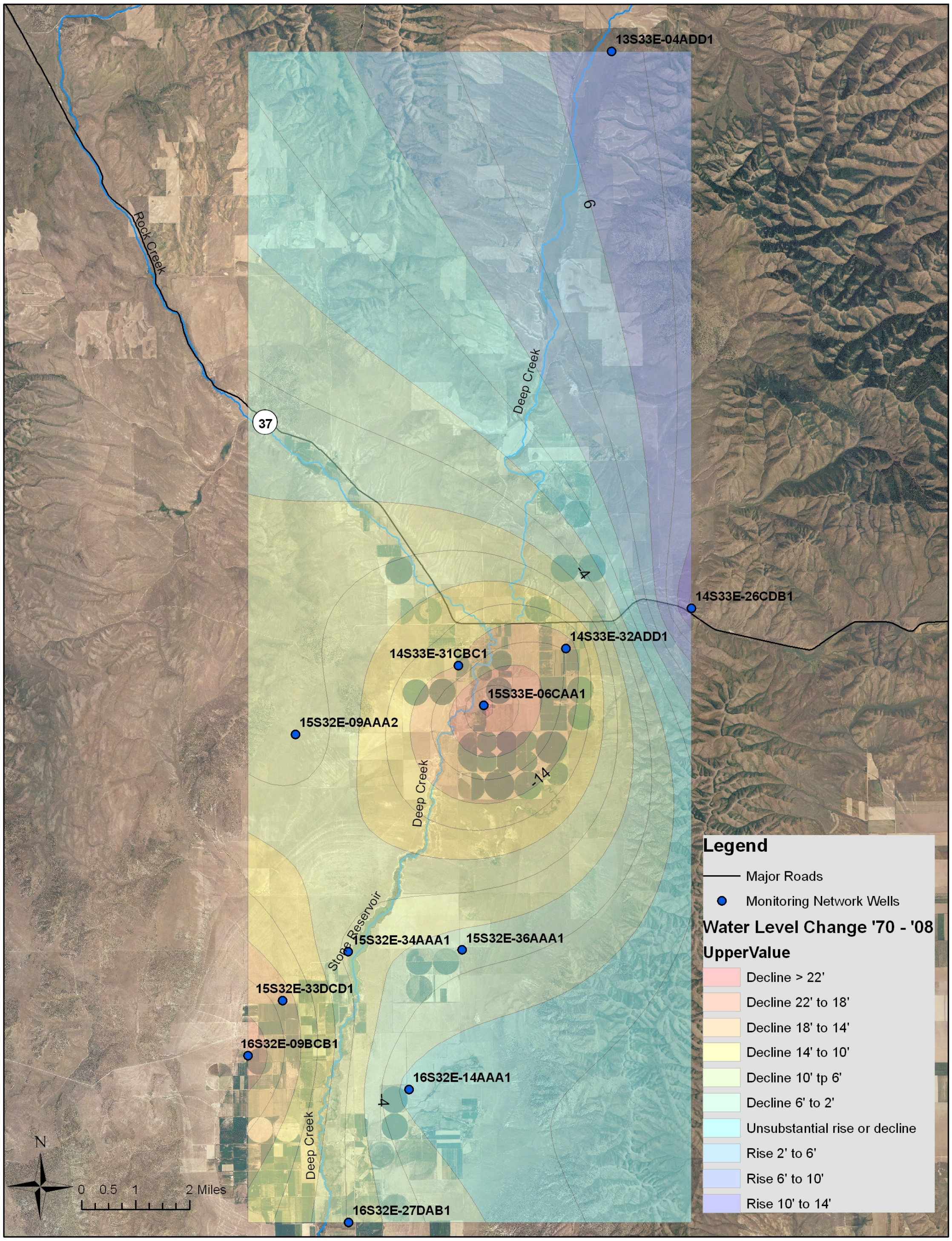

Figure 3. Water level change map for the Curlew Valley from 1970 through 2008.

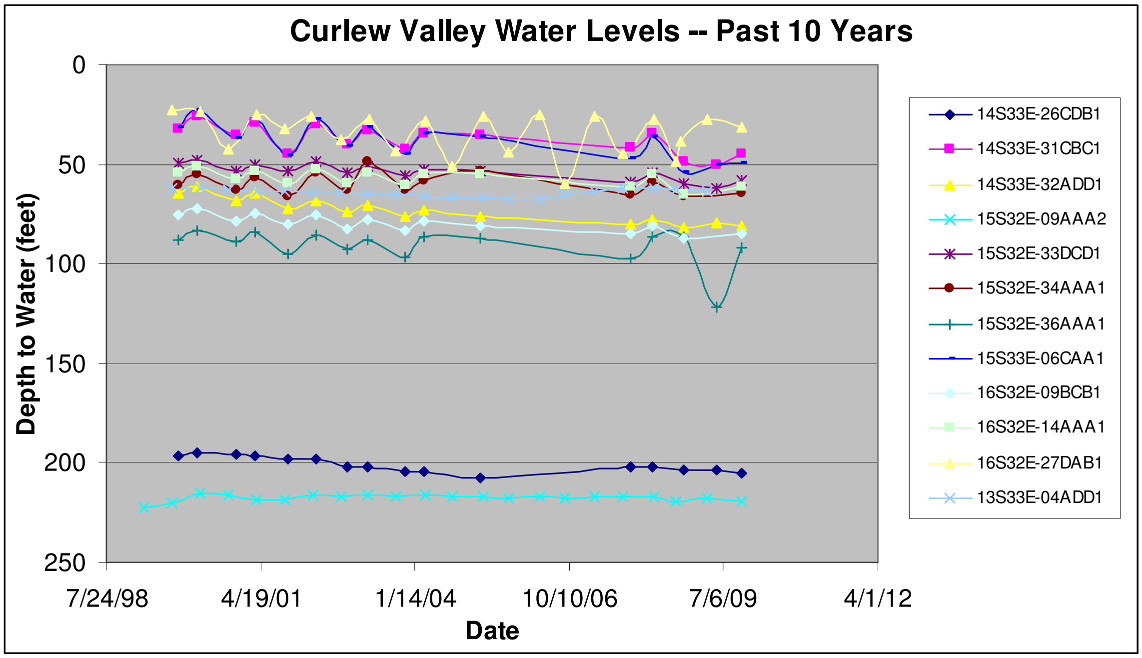

Figure 4. Previous 10 years of water levels for wells in the Curlew Valley water level monitoring network.

Conclusions and Recommendations

The data collected from the Curlew Valley ground water level monitoring network indicates the water levels in the area are declining at a moderate rate (0.8 feet per year). The most significant declines have occurred near the highest density of irrigated lands, in the southern half of the valley. Therefore, continuation of this monitoring is essential to ensure more drastic water level declines do not occur within this CGWA.

Based on the coverage of the current monitoring wells, it is recommended that at least one more monitoring well be incorporated into the northern portion of the monitoring network. Currently, only one well exists in the northern half of the Curlew Valley CGWA outline. One or more additional wells in the northwestern portion of the CGWA would provide a better coverage of the monitoring throughout the valley.

References

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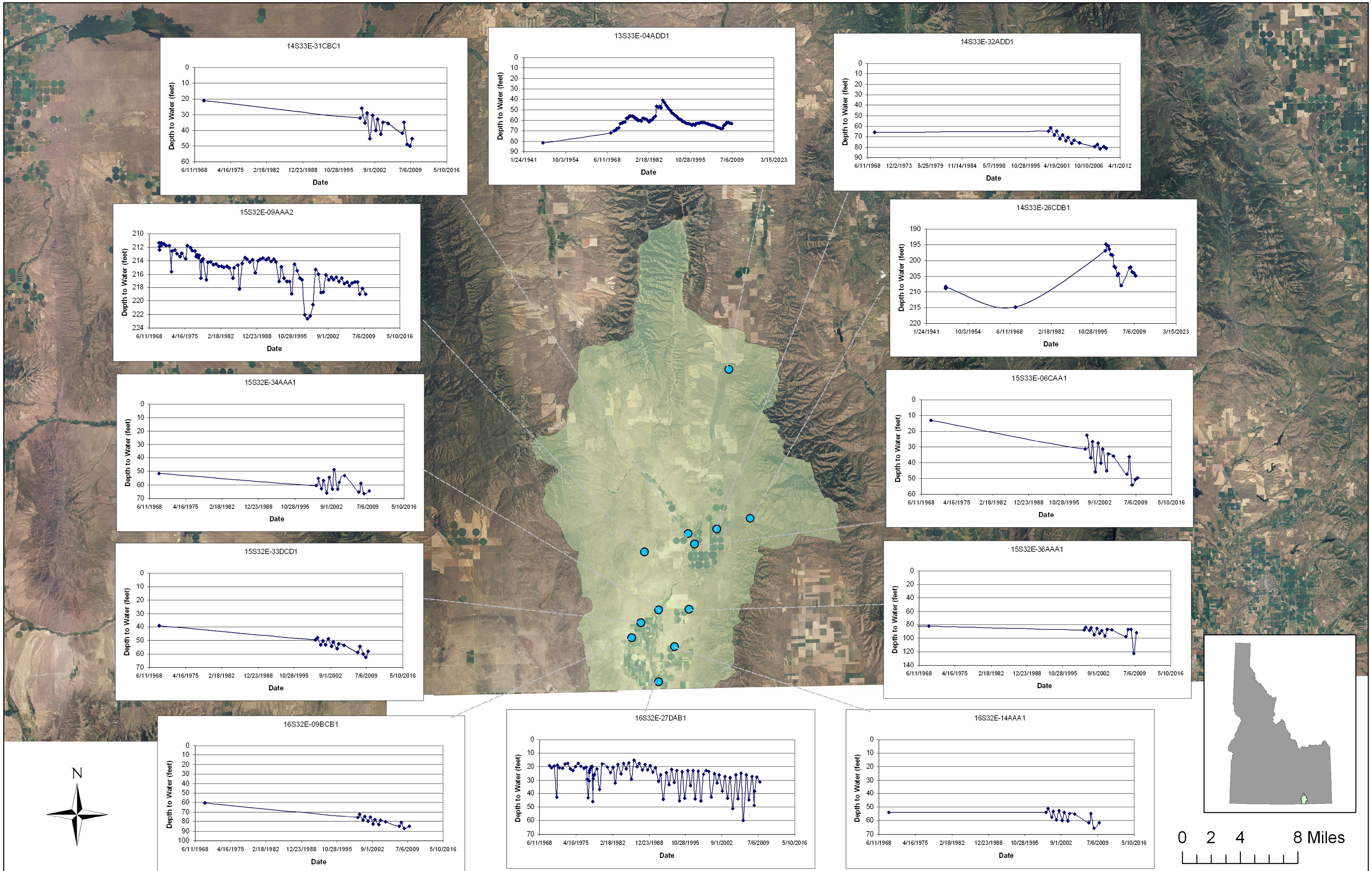
APPENDIX A

HYDROGRAPHS OF CURLEW VALLEY MONITORING NETWORK



14S33E-31CBC1
13S33E-04ADD1
14S33E-32ADD1
15S32E-09AAA2
14S33E-26CDB1
15S32E-34AAA1
15S33E-06CAA1
15S32E-33DCD1
15S32E-36AAA1
16S32E-09BCB1
16S32E-27DAB1
16S32E-14AAA1
Depth to Water (feet)
Date
N
0 2 4 8 Miles